DARPA DSO

New Science for National Security

Dr. Michael J. Goldblatt
Director

Dr. Steven G. Wax
Deputy Director

Defense Sciences Office

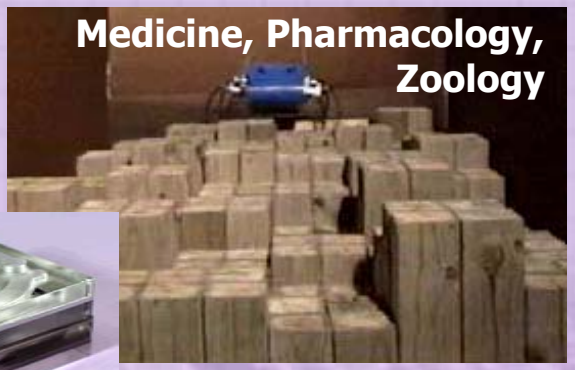
Mission: Vigorously pursue the most promising discoveries and innovations in science and engineering to create paradigm shifts in defense capabilities

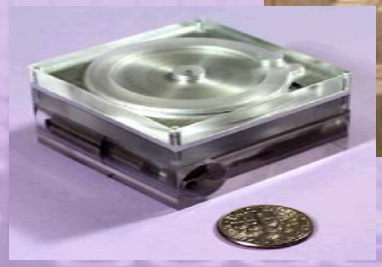
Biological Sciences | Materials & Devices | Mathematics

Diverse Programs

Hardware/Devices in the hands of soldiers

Diverse Disciplines





Engineering, Physics, Materials

New Science for National Security

Dr. Michael Goldblatt, Director
Dr. Steven Wax, Deputy Director

Materials, Devices, and Mathematics

Dr. Valerie Browning
Dr. Leonard Buckley
Dr. Leo Christodoulou
Dr. William Coblenz
Dr. Douglas Cochran
Dr. Ephrahim Garcia
Dr. Michael Gardos
Dr. Dennis Healy
Dr. Carey Schwartz
Dr. Rosemarie Szostak
Dr. Stuart Wolf

Biological Sciences

Dr. Joseph Bielitzki
Dr. John Carney
Dr. Ralph Chatham
Dr. Mildred Donlon
Dr. Eric Eisenstadt
Dr. Kurt Henry
Dr. Anantha Krishnan
Dr. Michael Krihak
Dr. Stephen Morse
Dr. Alan Rudolph
Dr. Wallace Smith

Col Thomas Brewer, USAMRIID

New Science for National Security

Dr. Michael Goldblatt, Director ***Nutrition/JD***
Dr. Steven Wax, Deputy Director ***Ceramic/Chemical Engineering***

Materials, Devices, and Mathematics

Dr. Browning ***Physics***
Dr. Buckley ***Material Science/Polymers***
Dr. Christodoulou ***Metallurgy***
Dr. Coblenz ***Ceramic Engineering***
Dr. Cochran ***Applied Mathematics***
Dr. Garcia ***Aerospace Engineering***
Dr. Gardos ***Material Science & Engineering***
Dr. Healy ***Mathematics***
Dr. Schwartz ***Mathematics***
Dr. Szostak ***Chemistry***
Dr. Wolf ***Physics***

Biological Sciences

Dr. Bielitzki ***Veterinary Medicine***
Dr. Carney ***Pharmacology***
Dr. Chatham ***Physics***
Dr. Donlon ***Microbiology/Immunology***
Dr. Eisenstadt ***Biology***
Dr. Henry ***MD – Critical Care***
Dr. Krishnan ***Mechanical Engineering***
Dr. Krihak ***Ceramic Sciences***
Dr. Morse ***Virology***
Dr. Rudolph ***Zoology***
Dr. Smith ***Physics***

Col Thomas Brewer, USAMRIID ***MD – Gastrointestinal (GI)***

Office Thrusts

Biological Sciences

- Biological Warfare Defense
- Biology
- Bio-Materials

Materials & Devices

- Functional Materials
- Smart Materials and Structures
- Structural Materials and Components
- Power and Water

Mathematics

- Applied and Computational Mathematics

Overview of DSO Eigen Areas

EIGEN AREAS

- **Brain Machine Interface**
  - Beyond Acting on Thoughts to Having Thoughts Act
- **Logistics Technologies**
  - Beyond Existing Logistics to Self Sustaining
- **Enhanced Human Performance**
  - Beyond Frailties of Life to Super Physiological Performance
- **Exploiting Complex Systems**
  - Beyond Accepting Intractability to Discovering and Exploiting Structure

Brain Machine Interface

EIGEN AREAS

- **Changing the Paradigm**
  - Beyond Acting on Thoughts to Having Thoughts Act
- **New Science**
  - Successful Use of Neurological Codes to Move Machinery
  - Ideas for Non-Invasive Reading of Neuronal Activity
  - Demonstration of Control of Motor Activity through Brain
- **Payoffs**
  - Active Control of Machines via Thought
  - Non-Invasive Deception Detection
  - Active Control of "BioBots"
- **Critical Technology Areas**
  - Understanding Location and Meaning of Neuronal Codes
  - Non-invasive Reading of Neuronal Activity
  - Understanding/Optimizing Brain Interactions with Physical/Material World (Biomimetic Actuators / Sensing)

Logistics Technologies

EIGEN AREAS

- **Changing the Paradigm**
  - Beyond Existing Logistics to Self Sustaining
- **New Science**
  - Novel Approaches for Making and Harvesting Resources (Energy, Water, Food, Materiel, …)
  - New Multifunctional Materials Concepts for Lightweight, Survivable Structures
  - Advances in Understanding of Healing
- **Payoffs**
  - Resources - Everywhere, Anytime
  - Fuel Efficient, Lightweight Structures,and Maintenance Free Engines
  - Eliminate Medic and Associated Infrastructure on Battlefield
- **Critical Technology Areas**
  - New Ways to Produce Resources on Demand
  - Self-Healing, Lightweight, Multifunctional Structures & New Engine Technologies
  - Automated Hemorrhage Control and Pain Management
  - In Field Manufacturing and Repair

Enhanced Human Performance

EIGEN AREAS

- **Changing the Paradigm**
  - Beyond Frailties of Life to Super Physiological Performance
- **New Science**
  - Understanding Effect of Sleep Deprivation on Brain Function
  - Emulation of Biological Survivability/Adaptability Demonstrated in Blood Components
  - Breakthroughs in Genomics and Proteomics
- **Payoffs**
  - Enhanced Physical
  - Enhanced Physiological Capabilities
  - Operational Dominance
- **Critical Technology Areas**
  - Developing approaches for improved situational and spatial awareness, cognitive abilities and wakefulness
  - Radical nutrition for endurance and strength coupled to modified training
  - Alternative metabolic sources for energy
  - Understanding and exploiting complex biosignature data

Exploiting Complex Systems

EIGEN AREAS

- **Changing the Paradigm**
  - Beyond Accepting Intractability to Discovering and Exploiting Structure
- **New Science**
  - Language for Representation and Modeling for Automatically Describing Underlying "Physical Laws" in Data
  - Creation of Exploitable Representation Directly From Experimental Data and Experience (Realized, Physics Based Models)
- **Payoffs**
  - Engineering "Bio-Like" Fault Tolerant and Self-Repairing Robustness in Structures and Systems - Discovery of Network Structure and Vulnerabilities
  - Understanding, Quantifying, and Controlling Uncertainty in Complex Systems
- **Critical Technology Areas**
  - Application-matched representations of complex networked systems
  - Methodologies for sieving large volumes of high dimensional data to identify and extract crucial low-complexity structure of underlying complex systems.
  - Emerging mathematical approaches for reducing dimensionality and complexity of both deterministic and non-deterministic systems.